

Pluto Express Mission To Pluto

Mission Information

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Pluto is the smallest, outermost and last-discovered planet in the Solar System and the only one that has never been visited by a spacecraft from Earth. Pluto and its relatively large satellite Charon are the destinations of a proposed spacecraft mission for the next decade, being developed for NASA by scientists and engineers at NASA's Jet Propulsion Laboratory.

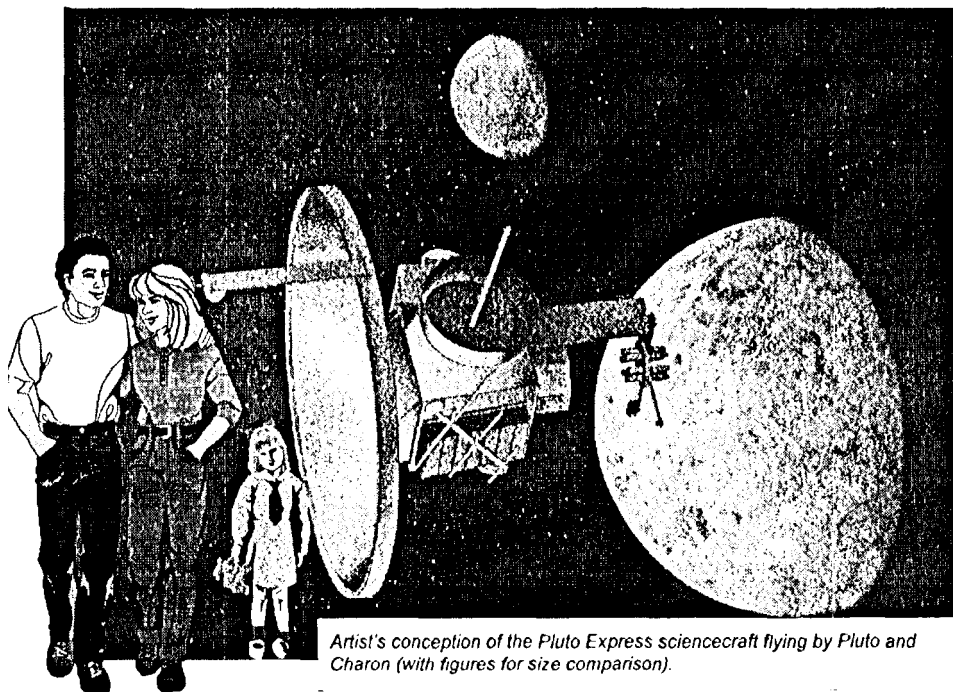
The mission concept calls for a small spacecraft and science payload, a fast development cycle and a flight time as short as possible. The cost is to be kept low. U. S., Russian and German scientists have discussed possible collaboration on the mission.

In addition to innovative mission planning and design, the Pluto Express team recognized the need for a new class of space technology to achieve the mission to Pluto. They have created novel designs and prototypes for instruments, spacecraft subsystems and operational techniques.

Russian scientists have proposed to build a 10 kilogram (22 pound) probe, known as a "Drop Zond." The Zond would enter Pluto's atmosphere, broadcasting data back to the spacecraft before it crashes into the planet's surface. A German proposal is under discussion to drop a probe into Jupiter's moon Io if the trajectory selected for Pluto Express utilizes a gravity assist from the giant planet.

There is a note of urgency in that Pluto's thin atmosphere, discovered only in 1988 when Pluto was closest to the Sun, is believed to be starting to condense as the planet moves outward again. Its 248-year orbit is elongated, and tilted relative to those of the other planets. Pluto crossed inside Neptune's orbit in 1979, and will recede beyond Neptune again in 1999 to be farthest from the Sun once more.

The U.S. and Russia are conducting a joint study of the possibility of launching the spacecraft on Russian



Artist's conception of the Pluto Express spacecraft flying by Pluto and Charon (with figures for size comparison).

launch vehicles. Two spacecraft allow mapping both sides of Pluto and Charon while providing redundancy. Since a Pluto "day" lasts 6.4 Earth days, a single spacecraft encounter would permit only one hemisphere of the planet to be mapped at high resolution. It will take 10 to 12 years to reach Pluto after launch.

The current version of the spacecraft would weigh (at launch) about 100 kilograms (220 pounds), making it smaller than the first interplanetary spacecraft, Mariner 2, launched in 1962. The Galileo spacecraft now in orbit around Jupiter, has a mass of 2200 kilograms. Yet the Pluto Express on-board flight computer, reduced to about the size of a small cassette recorder, will have 20 to 50 times the processing speed of the Galileo computer.

Nearly every part of the spacecraft represents a new generation of technology. The craft that will travel to Pluto is no longer considered a spacecraft, but rather is now referred to as a "sciencecraft." This vehicle will be unlike its predecessors, where science instruments were attached onto a spacecraft bus and interfaced with the main computer. On Pluto Express,

there is no such distinction. The sciencecraft design is based on the needs to take measurements with sensors that probe the visible, infrared, ultraviolet, and radio regions of the electromagnetic spectrum. The integrated sciencecraft will cost less, have lower mass, and be easier to operate from Earth than today's outer solar system spacecraft, yet it will provide more data about Pluto than any other first planetary encounter mission has.

Scientific objectives for Pluto Express include global geological and chemical mapping of Pluto and Charon and study of Pluto's atmosphere. Mission designers will seek an extended mission to explore newly-discovered bodies in the Kuiper Disk beyond Pluto.



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Preproject

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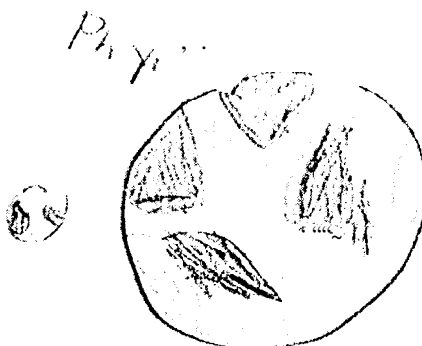
Pluto Express Involves Students In The Excitement of Mission Development and operations

Pluto Express has made significant strides toward making the concept of how we explore space more accessible to everyone. Educational outreach efforts have involved over 100 students from universities all over the country in hands-on roles working on designing the mission. Many hundreds more have participated in Pluto Express educational programs and over a thousand teachers have attended teacher training workshops sponsored by the project. A unique example of student involvement has been with the Art Center College of Design in Southern California. Art Center, one of the nation's premier schools for designers and artisans in all fields, is known throughout the world for their innovative and revolutionary designs of automobiles, transportation systems, and many other products. For thirteen weeks fourteen design students from the Department of Transportation Design at ArtCenter worked in tandem with the Pluto Express Spacecraft Design Team to develop options for a revolutionary new design for the spacecraft.

The Pluto Express Educational Outreach Program, managed by Jackie Giuliano, a former spacecraft mission planner and now college professor, has developed a series of Curriculum Guides

containing innovative exercises to enable educators to teach space science to students of all ages. Curriculum Developer Richard Shope describes these teaching strategies as "kinesthetic" in nature.

4 professional mime artist and science educator, Richard Shope, along with Jackie Giuliano, train students and teachers in



these innovative methods. These research-based teaching, strategies involve the body and the mind in a way that allows students to "live" the learning experience.

In one exercise, students become planets and create a scale model of the solar system. These minds-on activities develop an intuitive grasp of space science concepts and encourage an attitude of life-long learning.

The Curriculum Guides are available from the Pluto Express Project or through the Pluto Express Home Page on the Internet:

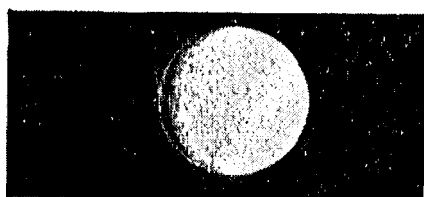
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Pluto Express represents a dynamic and challenging scientific mission, but it also represents a means to motivate the human spirit to achieve the best it can offer and to gain perspectives that can help us better appreciate the special planet on which we live - Earth.



Pluto Captures The imagination

Pluto has captured the imaginations of many since its discovery by Clyde Tombaugh on February 18, 1930. Clyde Tombaugh, then 24 years old, searched systematically through millions of images of stars on hundreds of photographic plates at the Lowell observatory in Flagstaff Arizona. People throughout the world sent letters to Lowell observatory suggesting a name for the newly discovered Planet X. The name for Pluto is credited to a Miss Venetia Burney of (xford, England who, 11 years old at the time, cabled the observatory with her suggestion shortly after the initial news of the discovery reached the world. Since that time, Pluto has represented the unexplored, the last world in a vast solar system brought closer to us by the Mariner, Pioneer, Voyager, and Galileo spacecraft. With the discovery of Pluto's moon Charon in 1978 and an atmosphere around Pluto in 1988, the mystery deepened. In fact, Pluto now seems more closely related to the newly discovered worlds of the distant Kuiper disk than to the other planets.



PLUTO NOT YET EXPLORED 29USA

In 1991, the U.S. Postal Service issued a series of stamps celebrating the planets and the spacecraft that explored them. The stamp for Pluto had the phrase "Not Yet Explored" printed on it, since no spacecraft has yet flown by this mysterious world.